Math 16B
Section 6.4

Integral Tables

Integral Tables are pages of formulas for antiderivatives.

Example: Use the given formula to do each integral.

1.) (page 417: # 13)

$$\int \frac{1}{u^2(a+bu)^2}\,du = \frac{-1}{a^2}\left[\frac{a+2bu}{u(a+bu)} + \frac{2b}{a}\ln\left|\frac{u}{a+bu}\right|\right] + C$$

$$\int \frac{1}{x^2(3+x)^2}\,dx$$

(Let $a=3$, $b=1$, and $u=x \xrightarrow{D} du=dx$)

$$= \frac{-1}{9}\left[\frac{3+2x}{x(3+x)} + \frac{2}{3}\ln\left|\frac{x}{3+x}\right|\right] + C$$

2.) (page 419: # 36)

$$\int u^n e^u \, du = u^n e^u - n \int u^{n-1} e^u \, du$$

$$\int x^3 e^x \, dx$$

(Let $n=3$, $u=x \xrightarrow{D} du=dx$)

$$= x^3 e^x - 3 \int x^2 e^x \, dx$$

(Let $n=2$, $u=x \xrightarrow{D} du=dx$)

$$= x^3 e^x - 3 \left[x^2 e^x - 2 \int x e^x \, dx \right]$$

(Let $n=1$, $u=x \xrightarrow{D} du=dx$)

$$= x^3 e^x - 3x^2 e^x + 6 \left[x e^x - \int x^0 e^x \, dx \right]$$

$$= x^3 e^x - 3x^2 e^x + 6x e^x - 6 e^x + C$$

3.) (page 419 : # 41)

$$\int u^n \ln u \, du = \frac{u^{n+1}}{(n+1)^2}\left[-1+(n+1)\ln u\right]+C, \quad n \neq -1$$

$$\int x^5 \ln(3x^2)\, dx$$

(Let $u = 3x^2 \xrightarrow{D} du = 6x\,dx \rightarrow \frac{1}{6}du = x\,dx$ and $x^2 = \frac{1}{3}u$)

$$= \int x^4 \ln(3x^2)\cdot x\, dx$$

$$= \int (x^2)^2 \ln(3x^2)\cdot x\, dx$$

$$= \int \left(\frac{1}{3}u\right)^2 \ln u \cdot \frac{1}{6}\, du$$

$$= \frac{1}{54}\int u^2 \ln u\, du \quad (\text{Let } n=2)$$

$$= \frac{1}{54}\left\{\frac{u^3}{3^2}\left[-1+(3)\ln u\right]+C\right\}$$

$$= \frac{1}{486}(3x^2)^3\left[-1+3\ln(3x^2)\right]+C$$

4.) (page 418: #21)

$$\int \sqrt{u^2 \pm a^2}\, du = \frac{1}{2}\left[u\sqrt{u^2 \pm a^2} \pm a^2 \ln\left|u + \sqrt{u^2 \pm a^2}\right|\right] + C$$

$$\int \sqrt{x^2 - 4x}\, dx$$

(Complete the Square.)

$$= \int \sqrt{(x^2 - 4x + 4) - 4}\, dx$$

$$= \int \sqrt{(x-2)^2 - 2^2}\, dx$$

(Let $a = 2$, $u = x - 2 \xrightarrow{D} du = dx$ and use "$-$" sign.)

$$= \int \sqrt{u^2 - 2^2}\, du$$

$$= \frac{1}{2}\left[(x-2)\sqrt{(x-2)^2 - 2^2} - 2^2 \ln\left|(x-2) + \sqrt{(x-2)^2 - 2^2}\right|\right] + C$$